

Figure 12.21

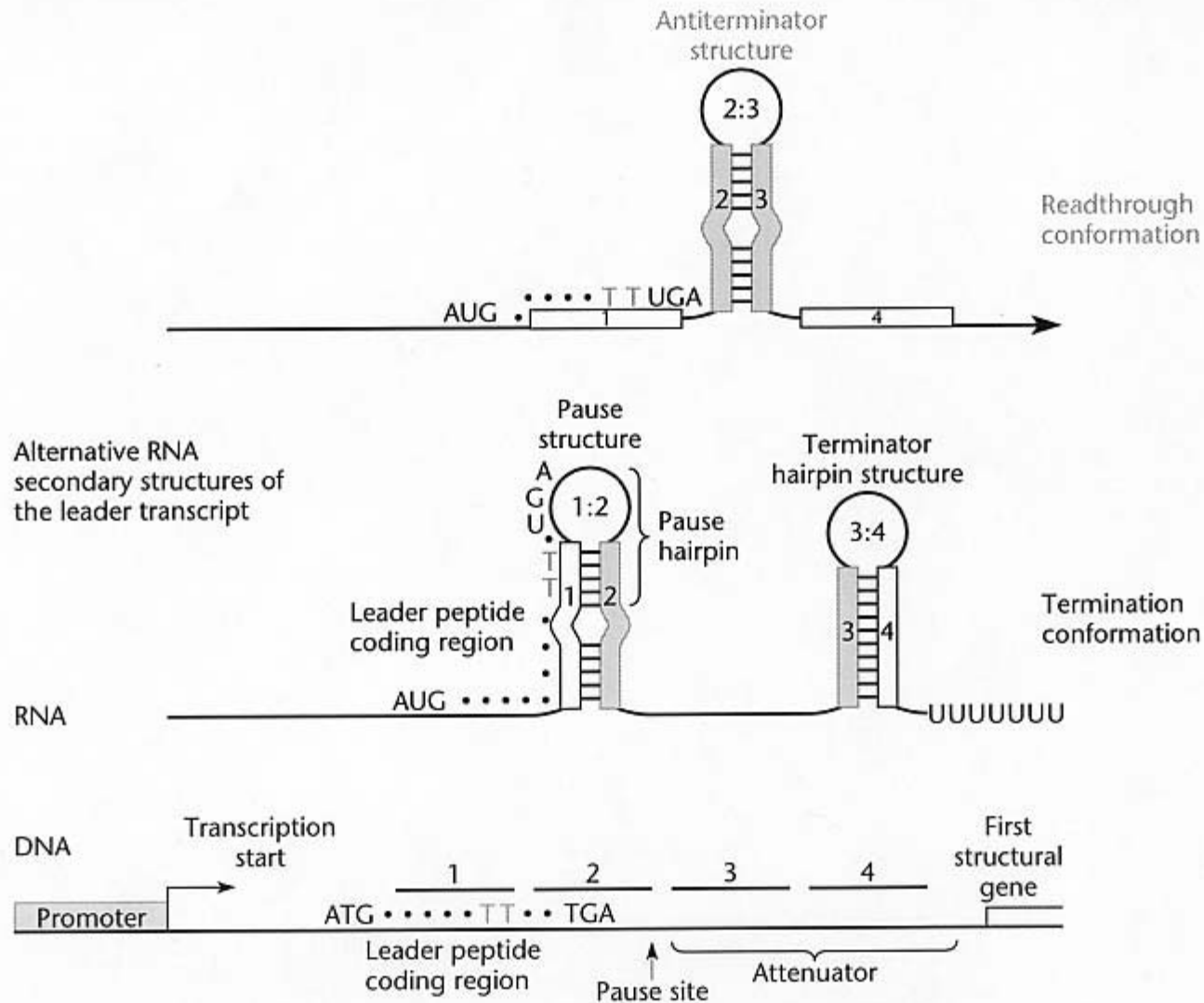


Figure 12.22

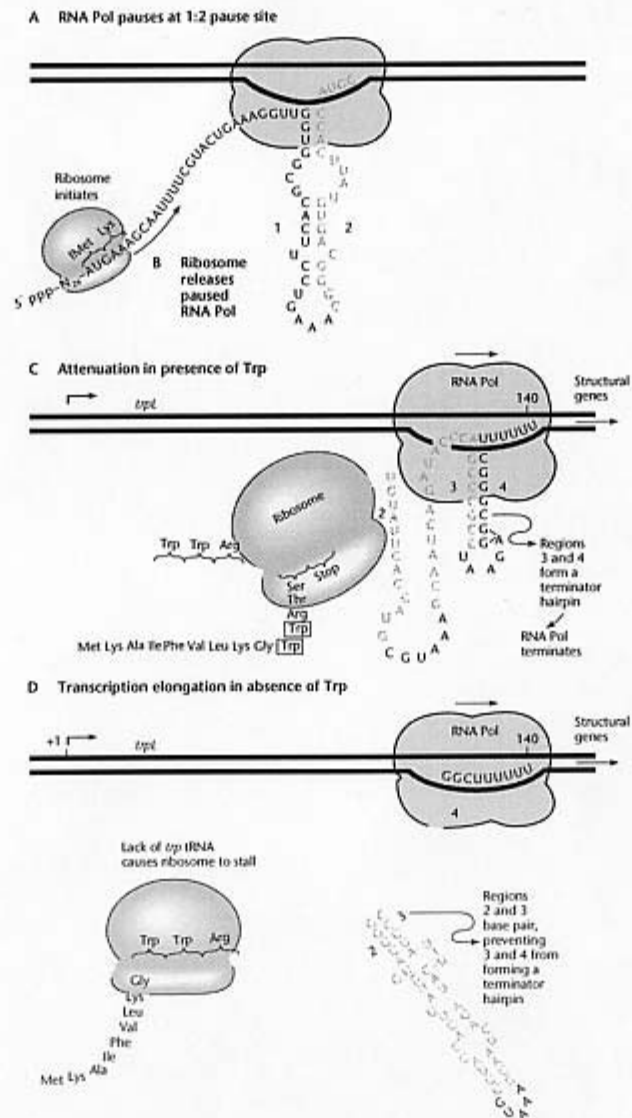


Table 13.1

TABLE 13.1 Some <i>E. coli</i> global regulatory systems				
System	Response	Regulatory gene(s) (protein[s])	Category of mechanism	Some genes and operons regulated
A. Nutrient limitation				
Carbon	Catabolite repression	<i>crp</i> (CAP, also called CRP)	DNA-binding activator or repressor	<i>lac</i> , <i>ara</i> , <i>gal</i> , <i>mal</i> , and numerous other C source operons
	Control of fermentative vs oxidative metabolism	<i>cra</i> (<i>IruR</i>) (CRA)	DNA-binding activator or repressor	Enzymes of glycolysis, Krebs cycle
Nitrogen	Response to ammonia limitation	<i>rpoN</i> (NtrA) <i>ntrBC</i> (NtrBC)	Sigma factor (σ^{54}) Two-component system	<i>glnA</i> (GS) and operons for amino acid degradation
Phosphorus	Starvation for inorganic orthophosphate (P _i)	<i>phoBR</i> (PhoBR)	Two-component system	>38 genes, including <i>phoA</i> (bacterial alkaline phosphatase) and <i>pst</i> operon (P _i uptake)
B. Growth limitation				
Stringent response	Response to lack of sufficient aminoacylated-tRNAs for protein synthesis	<i>relA</i> (RelA), <i>spoT</i> (SpoT)	(p)ppGpp metabolism	rRNA, tRNA
Stationary phase	Switch to maintenance metabolism and stress protection	<i>rpoS</i> (RpoS)	Sigma factor (σ^s)	>40 genes, including <i>otsBA</i> (trehalose synthesis) and <i>dps</i> (DNA-binding protein)
Oxygen	Response to anaerobic environment	<i>fnr</i> (Fnr)	CAP family of DNA-binding protein	>31 transcripts, including <i>narGHJ</i> (nitrate reductase)
		<i>arcAB</i> (ArcAB)	Two-component system	>20 genes, including <i>cob</i> (cobalamin synthesis)
C. Stress				
Osmoregulation	Response to abrupt osmotic upshift	<i>kdpDE</i> (KdpD, KdpE)	Two-component system	<i>kdpABC</i> (K ⁺ uptake system)
	Adjustment to osmotic environment	<i>rpoS</i> (RpoS)	Sigma factor (σ^s)	>16 genes, including <i>osmB</i> (an outer membrane lipoprotein)
		<i>envZ/ompR</i> (EnvZ/OmpR)	Two-component system	OmpC and OmpF outer membrane porins
Oxygen stress	Protection against reactive oxygen species	<i>micF</i>	Antisense RNA	<i>ompF</i> (porin)
		<i>soxS</i> (SoxS)	AraC family of DNA-binding proteins	>10 genes, including <i>sodA</i> (superoxide dismutase) and <i>micF</i> (antisense RNA regulator of <i>ompF</i>)
Heat shock	Tolerance to abrupt temperature increase	<i>oxyR</i> (OxyR)	LysR family of DNA-binding proteins	>10 genes, including <i>katG</i> (catalase)
		<i>rpoH</i> (RpoH)	Sigma factor (σ^{32})	>20 genes encoding Hsps (heat shock proteins), including <i>dnaK</i> , <i>dnaJ</i> , and <i>grpE</i> (chaperones), and <i>lon</i> , <i>clpP</i> , <i>clpX</i> , and <i>hflB</i> (proteases)
		<i>rpoE</i> (RpoE)	Sigma factor (σ^{24})	>10 genes, including <i>rpoH</i> (σ^{32}) and <i>degP</i> (a periplasmic protease)
pH shock	Tolerance of acidic environment	<i>cadC</i> (CadC)	ToxR-related DNA-binding protein	Many genes, including <i>cadBA</i> (amino acid decarboxylase)

Figure 13.1

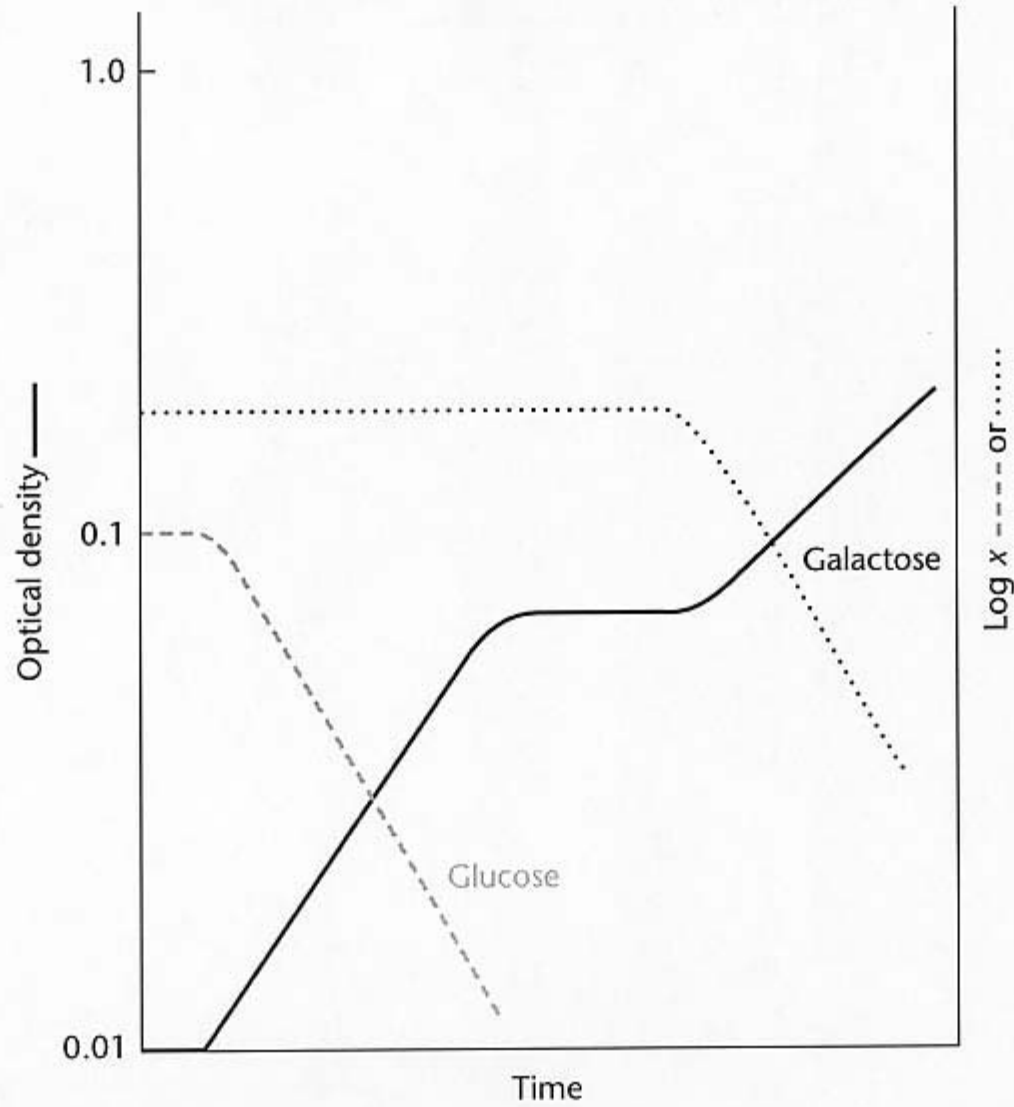


Figure 13.2

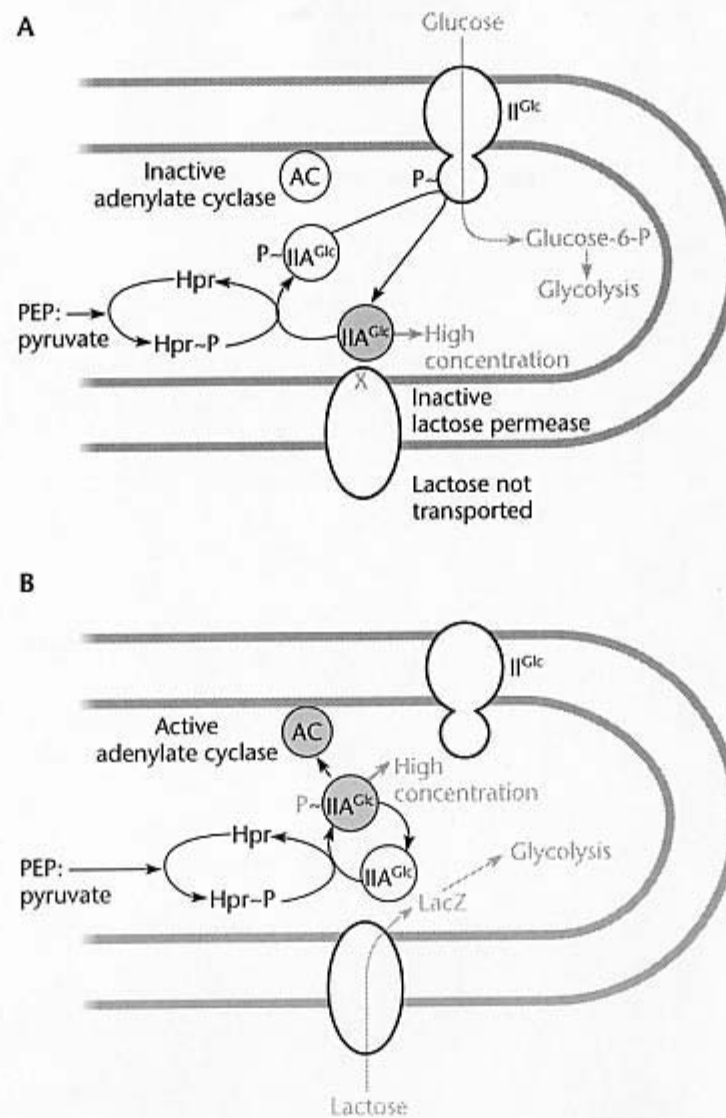
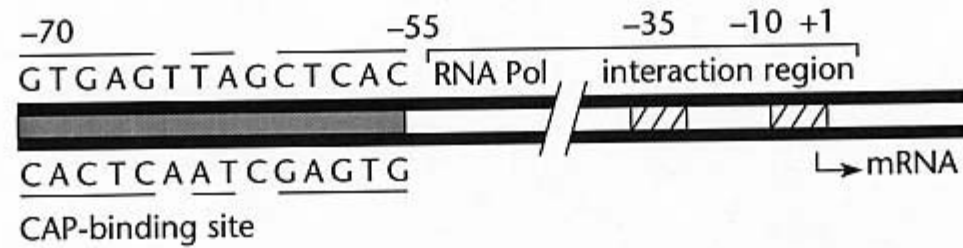


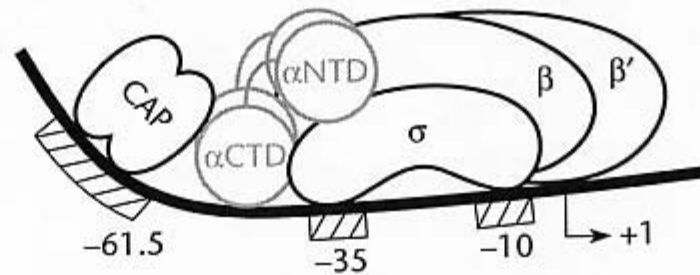
Figure 13.3

A



B

Class I promoter



Class II promoter

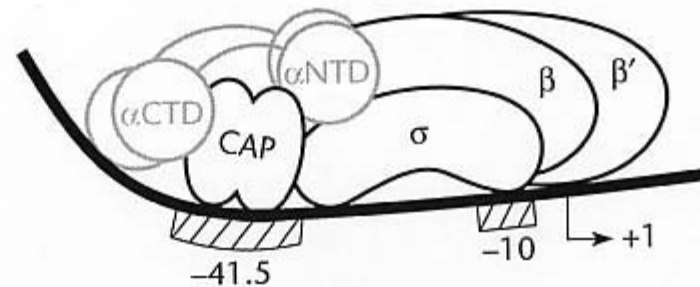


Figure 13.4

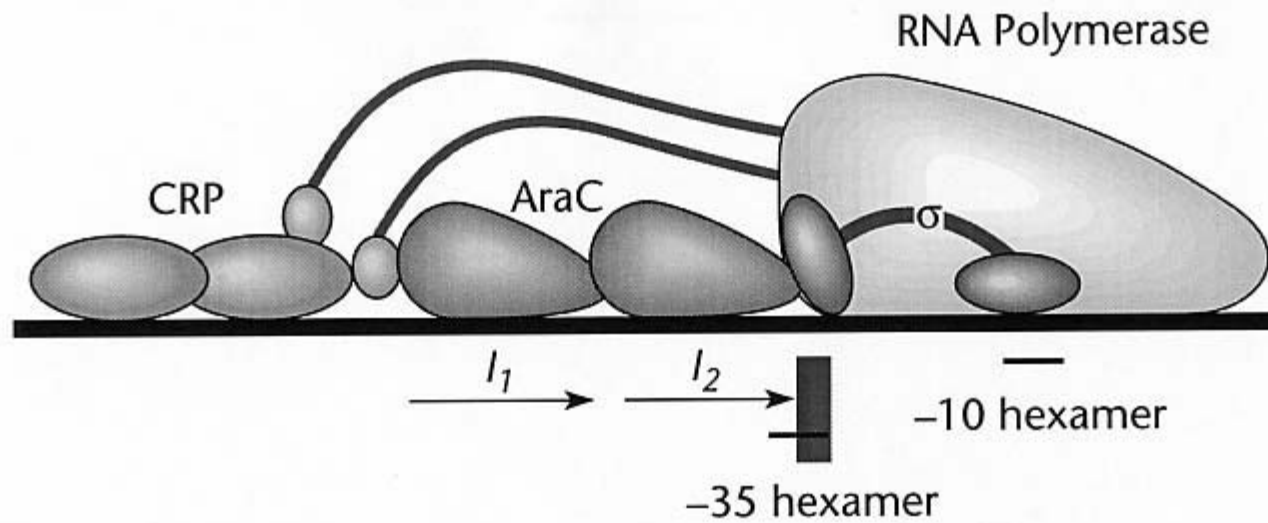


Figure 13.5

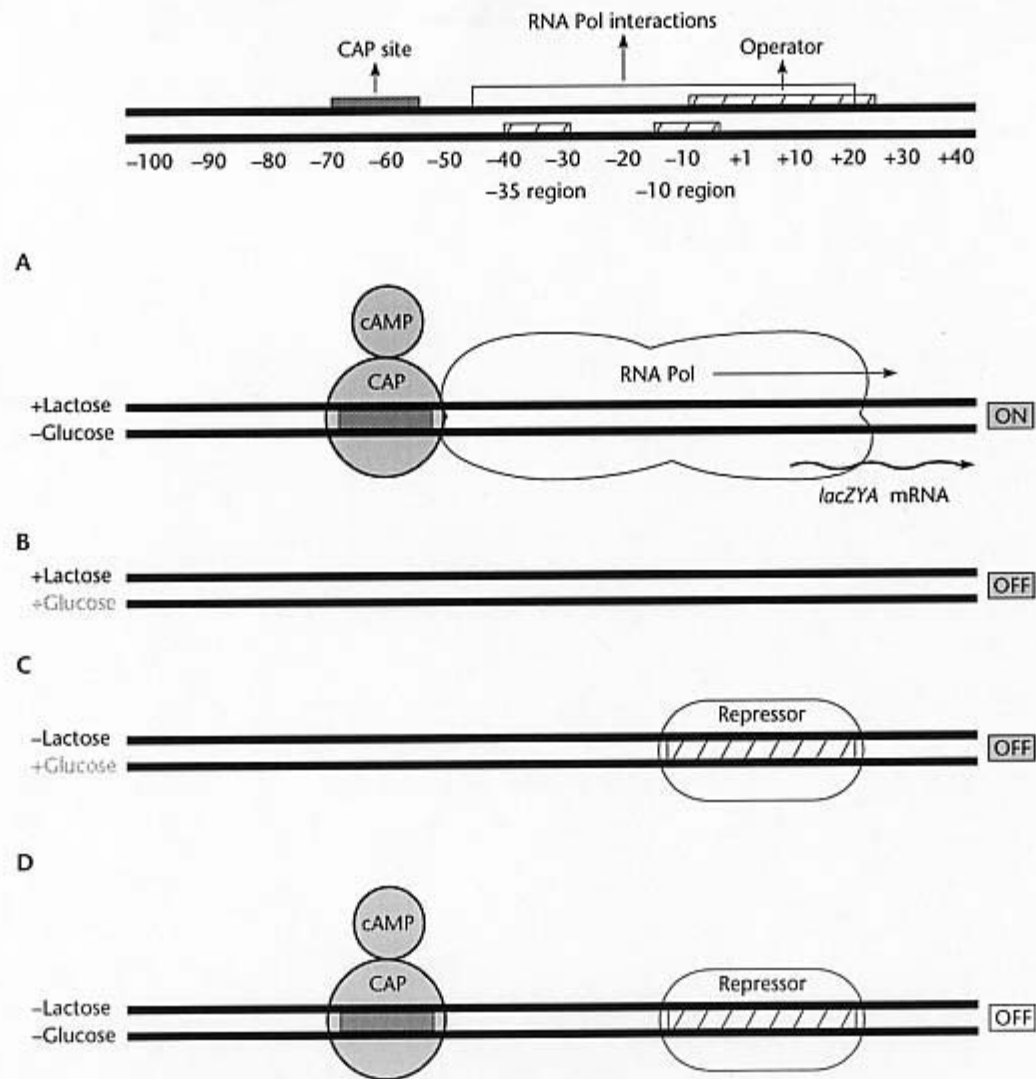


Figure 13.6

